Translation

PCT/EP2003/002859

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference M63PC011	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP2003/002859	International filing date (*day/month/year*) 19 March 2003 (19.03.2003)	Priority date (*day/month/year*) 25 March 2002 (25.03.2002)
International Patent Classification (IPC) or national classification and IPC C01F 5/22		
Applicant IMB + FRINGS WATERSYSTEMS GMBH		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
15 October 2003 (15.10.2003)	14 June 2004 (14.06.2004)
Name and mailing address of the IPEA/ Facsimile No.	Authorized officer Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/EP2003/002859

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☒ the description:

pages 1-9, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the claims:

pages 2-20, as originally filed

pages _____, as amended (together with any statement under Article 19

pages _____, filed with the demand

pages 1, filed with the letter of 29 March 2004 (29.03.2004)

☒ the drawings:

pages 1/2-2/2, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☐ the sequence listing part of the description:

pages _____, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-20	YES
	Claims		NO
Inventive step (IS)	Claims	1-20	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims		NO

2. Citations and explanations

1. Reference is made to the following documents:

D1: DE-A-10001493
D2: US-A-5385671
D3: US-A-4865744

2. Novelty

Document D1, which is considered to be the closest prior art, discloses a process for producing magnesium hydroxide from a salt solution. In this process the pH value of a heavy-metal-free solution is increased to 11.5 in order to precipitate the full quantity of dissolved magnesium hydroxide. The magnesium hydroxide is then separated either by mechanical means or using a membrane filter. After a counterflow washing stage with demineralised water, most of which is circulated by reverse osmosis, magnesium hydroxide with a high degree of purity can be obtained (see the drawing and the example).

Document D2 deals with a process for obtaining magnesium hydroxide. The hydroxide is produced by adding sodium lye to a magnesium-containing salt

solution to make it alkaline. The magnesium hydroxide is separated from the dissolved sodium salt by filtering the suspension through a cross-flow membrane (column 2, lines 21 to 55). The permeate is removed.

The subject matter of claim 1 differs from the disclosures of D1 and D2 in that the permeate produced by precipitation of the metal is returned to the cross-flow system.

The process according to **claims 1 to 19** is therefore considered novel (PCT Article 33(2)).

Claim 20 relates to a device for carrying out a process for producing a metal hydroxide from a salt solution. The device described in the present application differs from the devices for carrying out the processes according to D1 and D2 in that it includes at least one line for returning the permeate to a cross-flow filtration unit. The device according to **claim 20** is therefore novel.

3. Inventive step

The problem addressed by the present application can therefore be seen as that of providing a process and device for producing a high-purity metal hydroxide in a simple, fast and economical way.

Document D3 describes a process for the continuous workup of aqueous raw material suspensions in a multistage membrane separation unit. The suspension is a dye suspension. The process is characterised by the introduction in each membrane separation stage (n) (where n is a whole number greater than 1) of a dye

suspension (F_n) and wash water (WW_n), permeate (P_{n+1}) from the subsequent membrane separation stage (n+1) or mixtures of WW_n and P_{n+1}, and separation thereof into a dye suspension (F_{n+1}) and a permeate (P_n) (claim 1). The membrane separation unit works on the principle of ultrafiltration and/or cross-flow microfiltration (claim 7). The cross-flow microfiltration is usually carried out using microporous membranes with pore diameters of 0.1 to 40 µm, preferably 0.2 to 10 µm (column 5, lines 3 to 5). It is also possible to add, for example, a reverse osmosis process for further (complete) desalting (column 7, lines 55 to 57).

The solution proposed in **claims 1 to 19** of the present application is considered inventive (PCT Article 33(3)) for the following reasons:

It is known from D1 and D2 to precipitate magnesium hydroxide from a salt solution and to filter the resulting suspension through a cross-flow filter.

It is known from D3 to return the permeate from a cross-flow filter stage to a multistage membrane separation unit in order to reduce the salt content in the suspension. The dye-containing solution is repeatedly purified by the addition of wash water, and thus salts and other impurities are continuously removed from the suspension.

A person skilled in the art would not have adopted the cross-flow filtration process of D3 as a way of solving the aforementioned problem because D3 deals with the continuous purification of a dye suspension. Dye suspensions must have very good suspensibility and must retain good flow properties even when there are

high concentrations of dye particles in the solution. For this reason the particles in dye suspensions are well suspended and show little or no agglomeration. By contrast, in the present application the magnesium hydroxide is precipitated as voluminous, greasy and slimy agglomerates which are broken up by the claimed process as a result of the high turbulence created, and are prevented from re-forming. A person skilled in the art would therefore not have used the teaching of D3 in order to solve the problem addressed by the present invention.

In the present invention the returning of the permeate to the cross-flow filtration unit results in repeated purification of the metal-hydroxide-containing solution using an ever less salty permeate, which means that any concentration of unwanted impurities can be separated out of the solution.

4. Industrial applicability

The process and device for producing a metal hydroxide with a high degree of purity are clearly industrially applicable.